

patent. Joints about twice as long as broad, but the lower ones frequently shorter. Capsules orbicular, numerous, lateral, arising from all parts of the plant and usually on short stalks.

*Chantransia compacta* differs from *C. chalybea* in its compact, firm habit, more crowded branches, shorter joints and more scattered capsules.

I am unacquainted with *C. violacea*, Kütz., and am consequently unable to decide with certainty that this plant is not a variety of that species; but its difference in colour has induced me to propose it as a distinct species.

Kützing in his 'Species Algarum' mentions two other British species: as I am unacquainted with them, I subjoin his descriptions:—

5. *C. scotica* (Kütz.). Cæspite cæruleo-chalybeo, majori, trichomatibus  $\frac{1}{240}$ ''' crassis, ramis ramulisque remotis patentibus elongatis; articulis diametro plerumque duplo longioribus. Kützing, *Phyc. Gener.* p. 285; *Species Alg.* p. 430.

In Scotia legit cl. Klotzsch.

6. *C. violacea* (Kütz.). Cæspite minuto, violaceo, subgloboso; trichomatibus radiatim dispositis, rigidis, ramulis crebris approximatis, abbreviatis, patentibus, subsecundis; articulis inferioribus diametro fere æqualibus superioribus 2-3plo longioribus. Kützing, *Phyc. Germ.* p. 231; *Species Alg.* p. 431.

In fluviis et rivulis montanis Germaniæ et Scotiæ ad Lemanium fluviatilem.

XXV.—*A List of all the Mosses and Hepaticæ hitherto observed in Sussex.* By WILLIAM MITTEN, A.L.S.

BESIDES the species not before described as British, this list will be found to contain localities for others of rare occurrence or but little known, and will show the comparative rarity of the more common species.

With very few exceptions all the species enumerated have been gathered by the author himself; most of the previously known rarer species having been shown to him in their respective localities by Mr. Borrer, with whom he has examined many of the most productive parts of the county, and to access to whose collections he attributes chiefly whatever small amount of critical knowledge he may possess of these beautiful plants.

Tribe I. ANDREÆACEÆ.

Genus 1. *Andreaea*, Ehrh.

*A. rupestris*, Hedw.

"On the High Rocks;" Forster, Fl. Tonbridgensis.  
*Ann. & Mag. N. Hist.* Ser. 2. Vol. viii. 20

Nothing further is known respecting this moss, but it has been supposed that a small blackened state of *Jungermannia emarginata*, found on some of the High Rocks, might have been mistaken for it by Forster.

Tribe II. DICRANACEÆ.

Genus 1. *Archidium*, Brid.

1. *A. phascoides*, Brid.

*Phascum alternifolium*, Eng. Fl., not of Dickson.

Not common. In wet places on Henfield Common, on Tilgate Forest, and by roadsides near Hurstpierpoint.

Genus 2. *Angstrœmia*, B. et S.

2. *A. subulata* (Linn.), Mitten.

*Phascum subulatum*, Linn. Eng. Fl.

Frequent on banks by roadsides; found more rarely on the Downs.

3. *A. alternifolia* (Linn.), Mitten.

*Phascum alternifolium*, Dicks.

Far less common than the preceding species, and almost confined to clayey soils: it occurs at Hurstpierpoint in several places, at Henfield, and on Tilgate Forest.

On this species Bridel founded his genus *Pleuridium*, "ob thecam lateralem aut talem visam," but he seems to have been not well satisfied about it, for he takes care to follow his assertions on that point with "aut talem visam," or "aut talis videtur." The authors of the 'Bryologia Europæa' in their last review of these species have adopted Bridel's name *Pleuridium*, which appears to be neither founded on a true idea of their mode of fruiting nor applicable to the species.

4. *A. nitida* (Hedw.), Mitten.

*Phascum axillare*, Dicks. Eng. Fl.

Frequent in ditches and places where water is dried up in summer.

5. *A. cerviculata* (Hedw.), C. Müller.

*Dicranum cerviculatum*, Hedw. Eng. Fl.

Not rare on peat, and sometimes on wet sandy banks; at Hurstpierpoint, Albourne, Henfield, Tilgate Forest, and Tunbridge Wells.

6. *A. heteromalla* (Hedw.), C. Müller.

*Dicranum heteromallum*, Hedw. Eng. Fl.

Frequent, particularly on sandy soils.

*A. Hedwigii*, Mitten, *Dicranum subulatum*, Hedw., is stated to grow near Littlehampton in the Appendix to Horsfield's 'History of Sussex,' but nothing further seems known respecting it.

7. *A. varia* (Hedw.), C. Müller.

*Dicranum varium*, Hedw. Eng. Fl.

Frequent on all kinds of soils.

8. *A. rufescens* (Turn.), C. Müller.

*Dicranum varium*,  $\beta$ . *rufescens*, Eng. Fl.

Not rare on moist sandy or clayey banks.

9. *A. Schreberi* (Hedw.), C. Müller.

*Dicranum Schreberi*, Hedw., not *D. Schreberianum*, Eng. Fl.

In very small quantity and rarely fruiting in many places about Hurstpierpoint and Henfield.

10. *A. crispa* (Hedw.), C. Müller.

*Dicranum crispum*, Hedw. Eng. Fl.

In small quantity at the High Rocks, Tunbridge Wells.

11. *A. cylindrica* (Hedw.), C. Müller.

*Didymodon cylindricus*, Hook. Eng. Fl.

In stubbles on St. Leonard's and Tilgate Forests, and on hedgebanks in several places about Hurstpierpoint, but always without fruit.

On the forests this species is very short and inconspicuous, but it grows much more luxuriantly on a shaded bank near Hurstpierpoint.

12. *A. pellucida* (Hedw.), C. Müller.

*Dicranum pellucidum*, Hedw. Eng. Fl.

Common about the sand rocks, and less frequent on wet ditch banks; very seldom in fruit.

The variety of this species, *Dicranum flavescens*, Smith, Eng. Fl., is found on the Hungershall Rocks near Tunbridge Wells, but it has not been observed in Sussex.

### Genus 3. *Brachyodus*, Furnr.

13. *B. trichodes* (Web. et Mohr), Nees et Hsch.

*Weissia trichodes*, Hook. and Tayl. Eng. Fl.

On stones at Henley Hill, at Blackdown, and in the stone-pit at Henfield, the place where it was first observed in Britain by Mr. Borrer.

### Genus 4. *Campylostelium*, B. et S.

14. *C. saxicola* (Web. et Mohr), B. et S.

*Grimmia saxicola*, Schw. Eng. Fl.

On stones at Blackdown, where it was first observed by Mr. Borrer; on rocks and stones at Henley Hill, on a stone wall at Tillington, on blocks of stone in a rivulet near Wych Cross, and in the same situation on Tilgate Forest near Balcombe.

Genus 5. *Seligeria*, B. et S.

15. *S. pusilla* (Hedw.), B. et S.

*Weissia pusilla*, Hedw. Eng. Fl.

Not uncommon on chalk-stones about the Downs; on stones at Henley Hill near Midhurst.

16. *S. calcarea* (Hedw.), B. et S.

*Weissia calcarea*, Hedw. Eng. Fl.

On chalk about Lewes.

The preceding species is very commonly mistaken for this, which happens the more easily, as the form of *S. pusilla* which grows on the chalk is shorter-leaved than usual.

Genus 6. *Leptotrichum*, Hampe.

17. *L. flexicaule* (Schw.), Hampe.

*Didymodon longirostris*?, Eng. Fl.

Abundant on the Downs, and rarely by roadsides; always sterile.

18. *L. homomallum* (Hedw.), Hampe.

*Didymodon heteromallus*, Hook. and Tayl. Eng. Fl.

Rare; it occurs at Blackdown, on Tilgate Forest, at the High Rocks, and in some other places about Tunbridge Wells.

19. *L. tortile* (Schrad.), Hampe.

*Didymodon pusillus*, Hedw. Eng. Fl.

In the stone-pit at Henfield in very small quantity, and on a sandy bank near Hurstpierpoint, where it was very plentiful for one season, 1847, but has scarcely been seen since.

Genus 7. *Dicranum*, Hedw., C. Müller.

20. *D. spurium*, Hedw.

On Waterdown and Broadwater Forests near Tunbridge Wells, but without fruit.

21. *D. scoparium*, Hedw.

Frequent in woods, and varying greatly; the leaves sometimes all straight, more commonly secund, and rarely, about the sand rocks, all falcate-secund.

22. *D. majus*, Turn.

*D. scoparium*,  $\beta$ . *majus*, Eng. Fl.

Not common: confined chiefly to the neighbourhood of the sand rocks, and St. Leonard's Forest.

23. *D. Bonjeani*, De Notaris; "dense cæspitosum fragile errec-

tum vel ascendens fastigiatis breviter ramosum robustum dense foliosum, apice substricto vel subcuspidato; folia caulina paucisper secunda vel erecto-patentia, e basi lata plana lanceolata latiusculo-acuminata dentibus acuta, apice subplano loriformi, superne argute serrata et leviter transversim undulata, nervo angustissimo evanido, omnino e cellulis longis robustis parietibus crassis valde interruptis flavidis præditis areolata, cellulis alaribus planiusculis paucis robustis brunneis dein marcescentibus; perichætialia in cylindrum convoluta late vaginantia superne sinuato-rotundata subito acuminata integra obsolete nervia; theca oblongo-cylindracea erecto-curvata subapophysata lævis exannulata fuscenscens, operculo longi-subulato; perist. dentes angusti pallide purpurei bifidi."—*C. Müller, Synops. p. 369.*

*D. palustre*, B. et S. Bryol. Europ. Dicranum, p. 39. t. 31.

Frequent in bogs, but always barren.

This species has no doubt commonly been passed over as a state of *D. undulatum* or of *D. scoparium*, to which last in habit and appearance it has great resemblance, but it differs in having the upper part of its leaves broader and more strap-shaped and not subulate; the nerve vanishes below the point, in *D. scoparium* it is excurrent; the areolation of the leaves is much more lax than in *D. scoparium* or *D. Schraderi*; the capsules without opercula, sent by Mr. Spruce and Mr. Gardiner, resemble those of *D. scoparium*. As in *D. undulatum*, the leaves of this moss are prettily undulated, especially when dry.

24. *D. Scottianum*, Turn.

*D. flagellare*,  $\beta$ . Eng. Fl.

On all the sand rocks.

25. *D. Funkii*, C. Müller; "pulvinato-cæspitosum humile pallide viride fragile subsimplex strictum, inferne fuscidulo-tomentosum tenuius, superne crassius foliosum, parce fructificans; folia caulina erecto-patentia stricta e basi longa tenera laxissime et pellucide areolata lanceolato-acuminata latinervia, dorso scabra, apice denticulata, cellulis alaribus raro conspicuis, paucissimis tantum marginalibus hyalinis; folia ramorum steriliū apicis angustissime lanceolata linearia laxè quadrate et amœne pellucide areolata valde canaliculata strictissima laxinervia crassa; perichætialia vaginantia basi laxius sed superne ut in caulinis minute et incrassato-areolata; thecæ paucæ solitariae in pedunculis valde cygneis ovaes subpyriformes leviter sulcatæ olivaceæ, operculis conico-subulatis rubentibus obliquis; calyptra parce fimbriata; peristomium *D. turfacei*."—*C. Müller, Synops. p. 393.*

*Campylopus fragilis*, Bryol. Europ. *Campylopus*, p. 4. t. 2.

On all the sand rocks, but seldom in fruit.

This pretty moss forms small dense tufts in cracks in the sand rocks. The upper parts are of a fresh or yellowish green colour, the lower pale brown; the leaves are all erecto-patent and subulate from a more elliptic pale base than in *D. flexuosum*; the large cells found at the base of the leaves of all *Dicrana* are scarcely visible in this species, being reduced to a single row of cells. In *D. flexuosum* this part is more developed and coloured of a deep red-brown, and the areolation of the leaves is closer and more dense, and the leaves are all much longer and often falcate. The capsules resemble those of *D. turfaceum*.

In the male plant the flowers are collected into capituli of four or five flowers each, at the summit of every innovation.

*D. densum*, Schleich., differs from the present species principally in its straighter and more appressed leaves; but whether it is not a form produced by growing "ad margines fossarum in paludosis prope Roché," as stated on the label of Mr. Borrer's authentic specimen, is questionable.

*D. Funkii* never grows on the ground in Sussex.

26. *D. turfaceum*, C. Müller; "dense cæspitosum humile inferne interdum divisum erectum haud tomentosum viride substrictum, inferne nudiusculum, superne longe comosum, haud falcatum; folia caulina erecto-patentia apice paulisper falcata, lanceolato-subulata longius capillacea canaliculata latinervia, dorso scabra, summo apice denticulata, cellulis alaribus minus conspicuis parvis laxis tenerrimis paucis planis prædita, e cellulis inferne quadratis pellucidis parvis superne minutissimis areolata; perichætialia intima cylindræo-convoluta, e basi longe vaginante magis sensim subulata, inferne laxè pellucide superne minute areolata, longiora, apice denticulata; theca plerumque solitaria in pedunculo valde arcuato ovalis basi vix apophysata glabra sulcata pallida, operculo conico subulato obliquo longiori rubente; perist. dentes ad medium fissi, cruribus tenuissimis hyalinis rugulosis haud nodosis; calyptra ciliis albis inæqualibus flaccidis fimbriata."—C. Müller, *Synops.* p. 399.

*Campylopus turfaceus*, Bryol. Europ. *Campylopus*, p. 4. t. 3.  
*Dicranum flexuosum*, Eng. Fl. in part.

Not rare in moist sandy places.

The most slender of all the British species, with longer and more subulate capillary leaves, which are often broken and strewed in abundance over the patches of the plant. As in *D. Funkii*, the enlarged cells at the base of the leaf are reduced to three or four in number, and not perceptible unless expressly looked for; but it appears distinct from that moss in its longer, more flexuose and loosely placed leaves.

27. *D. flexuosum*, Hedw.

About the sand rocks, and by the bog on Chailey North Common.

Tribe III. POTTIACEÆ.

Genus 1. *Schistidium*, Brid.

28. *S. Floerkeanum* (Web. et Mohr), Mitten.  
*Acaulon Floerkeanum*, C. Müller, Synops. p. 21.

Frequent in stubbles on chalky or clayey soils.

29. *S. muticum* (Schreb.), Mitten.  
*Acaulon muticum*, C. Müller, Synops. p. 22.  
*Phascum muticum*, Schreb. Eng. Fl.

On banks and in stubbles, not very common.

30. *S. triquetrum* (Spruce), Mitten.  
*Phascum triquetrum*, Spruce in Eng. Bot. Suppl. 1901.  
*Acaulon triquetrum*, C. Müller, Synops. p. 22.

On the cliffs between Brighton and Newhaven.

Genus 2. *Pottia*, Ehrh., C. Müller.

31. *P. cuspidata* (Schreb.), Mitten.  
*Phascum cuspidatum*, Schreb. Eng. Fl.

Common in stubbles and on banks.

32. *P. curvicolla* (Hedw.), Mitten.  
*Phascum curvicollum*, Hedw. Eng. Fl.

Not unfrequent about the Downs.

33. *P. recta* (With.), Mitten.  
*Phascum rectum*, With. Eng. Fl.

More frequent than the preceding, and often growing with it, but seldom seen off the chalk.

34. *P. bryoides* (Dicks.), Mitten.  
*Phascum bryoides*, Dicks. Eng. Fl.

On the coast at Aldrington near Brighton, and on the cliffs between Brighton and Newhaven; it has also been met with by Mr. Borrer on the Downs at Piccombe and near Lewes, and near the Devil's Dyke.

35. *P. cavifolia*, Ehrh.  
*Gymnostomum ovatum*, Hedw. Eng. Fl.

Cliffs and walls between Brighton and Newhaven, and about Hove, also at Hurstpierpoint, but almost confined to the coast.

36. *P. crinita*, Wils.

Rare: growing intermixed with *P. Heimii* amongst the shingle at Aldrington.

37. *P. Wilsoni*, B. et S.  
*Gymnostomum Wilsoni*, Hook. Eng. Fl.

On a sandy bank at Barrow Hill, Henfield, where it has been known to Mr. Borrer for many years.

C. Müller refers hither with doubt the *Gymnostomum truncatulum*,

*β. solivagum*, Brid. i. p. 69, sent by Green to Bridel from Hampstead and Plumstead Heaths. *P. eustoma* grows in both places, and so far as soil is concerned they are very likely to produce *P. Wilsoni*.

38. *P. eustoma*, Ehrh.

*Gymnostomum truncatulum*, Hedw. Eng. Fl.

Common on banks and in stubbles.

39. *P. Heimii*, Furn.

*Gymnostomum Heimii*, Hedw. Eng. Fl.

On the coast at Newhaven, Hove, Shoreham and Lancing.

40. *P. minutula* (Schw.), Hampe.

*Gymnostomum conicum*, Schw. Eng. Fl.

Very common in stubbles and waste places.

41. *P. Starkeana* (Hedw.), C. Müller.

*Weissia Starkeana*, Hedw. Eng. Fl.

At Hove, and on the cliffs between Brighton and Newhaven; not rare in stubbles, but most frequent near the coast.

42. *P. cæspitosa* (Bruch), C. Müller.

*Anacalypta cæspitosa*, B. et S. Bryol. Europ. Anacalypta, p. 3. t. 2.

“*Cæspitulosa*, parvula; caule subramoso vel ramoso; foliis patentibus, ovato- et oblongo-lanceolatis, concavis, margine haud revolutis, costa in mucronem brevem excedente, perichætalibus vaginantibus; capsula ovata, operculo longirostro, annulo unam cellularum seriem sistente, peristomii dentibus plus minus perfectis, in linea divisurali obsoleta fissis vel pertusis.”—*Bryol. Europ. l. c.*

Rare: on Woolsonbury Hill near Hurstpierpoint.

Intermediate between *P. Starkeana* and *P. lanceolata*, but agreeing more nearly with the first; it differs however in the form and never reflexed margins of its leaves; the three perichætal leaves are much widened and embrace the base of the yellow seta; the capsule is of a fine orange-brown when mature, ovate and not at all tapering downwards into the seta; just below the mouth it is a little constricted; the peristome is similar to that of *P. lanceolata* and equally variable; the calyptra is smooth and not scabrous as in *P. Starkeana*.

43. *P. lanceolata* (Hedw.), C. Müller.

*Weissia lanceolata*, Hook. and Tayl. Eng. Fl.

Not uncommon, particularly about the Downs.

Genus 3. *Trichostomum*, Hedw.

44. *T. cylindricum* (Bruch), C. Müller.

*Weissia tenuirostris*, Hook. and Tayl. Eng. Fl.

On all the sand rocks, but always sterile.



45. *T. mutabile*, Bruch.

*Didymodon brachydontius*, Wils. Eng. Fl.

Common on the Downs; and at Shoreham, growing plentifully on the scanty humus between the shingle, exposed to immersion at very high tides; always sterile.

46. *T. crispulum*, Bruch.

*Didymodon crispulus*, Wils. Eng. Fl.

Nearly as common as the last, but like it confined to the chalk and the sandy sea-shore, and barren.

47. *T. rubellum* (Hoffm.), Rabenh.

*Weissia curvirostra*, Hook. and Tayl. Eng. Fl.

Frequent on walls and roofs, and on the ground about the roots of trees.

48. *T. rigidulum*, Sm.

*Didymodon rigidulus*, Hedw. Eng. Fl.

Rare: in small quantity at Henley Hill and about Hurstpierpoint.

49. *T. trifarium*, Sm.

*Didymodon trifarius*, Sw. Eng. Fl.

Frequent on the Downs; growing on the earth in tufts about the roots of trees; it is also common on sandstone and on mortar in walls built of sandstone, but rarely fertile.

50. *T. topiaceum*, Brid.

On a wet sandy bank near Hurstpierpoint; at Hastings on and above the cliffs near the Dripping Well, and on walls at Midhurst.

51. *T. convolutum*, Brid.

*Didymodon nervosus*, Hook. and Tayl.

On the cliffs between Brighton and Beachy Head, and at Hastings.

Genus 4. *Barbula*, Hedw.

52. *B. aloides*, B. et S.

*Tortula rigida*, Eng. Fl.

Common about the Downs, and less frequently on clayey banks. This is the *T. rigida* of the Flora of Tunbridge Wells.

53. *B. ambigua*, B. et S.

On a sandy bank near Hurstpierpoint, where it grew very sparingly in 1849.

54. *B. rigida*, Schultz.

*Tortula enervis*, Eng. Fl.

In small quantity about a chalk-pit at Newtimber near Hurstpierpoint.

55. *B. revoluta*, Schw.*Tortula revoluta*, Eng. Fl.

Not unfrequent on walls.

56. *B. Hornschuchiana*, Schultz; "dioica; laxe et late cæspitosa flavescens fragilis gracillima erecta parce breviter dichotoma; folia caulina sicca incumbentia, madefacta patentia, perfecte late lanceolata acutissima, nervo crasso excurrente vel in superioribus excedente, integerrima, inferiora minute sed dense areolata sub-lævia margine minus revoluta, superiora vel perichætialia parum majus areolata, margine erecto; theca oblongo-cylindrica, badia parva subcurvula, anguste annulata, operculo oblique subulato; perist. præcedentis." [*B. revoluta*] C. Müller, *Synops.* p. 608.

Probably not uncommon. At Aldrington near Brighton, growing on the sandy soil between the road and the sea; at Clayton on the chalk; on the Forest near Balcombe Tunnel; and Mr. Borrer has gathered it on Tunbridge Wells Common.

Similar as this species is to *B. revoluta* in size and appearance, yet when carefully compared, it presents many points of difference. The stems are about half an inch high, green, or more frequently dirty yellowish; leaves patent, when dry appressed to the stem, and slightly twisted, lanceolate, acute; the nerve excurrent into a sharp point; the margins revolute; the perichætial leaves are broader below and more subulate above, of a thinner and looser texture, and the margins are not reflexed; the capsules are subcylindrical; the peristome resembles that of *B. revoluta*. The plant does not form compact tufts like *B. revoluta*, but grows in loose patches on the ground: the leaves taper gradually to the point even when the margins are spread out. In *B. revoluta* the leaves are obtuse mucronate, and when the margins are spread out the point of the leaf is found to be broad and rounded. The perichætial leaves are six in both species: those of *B. Hornschuchiana* are subulate from an ovate base, but those of *B. revoluta* are broadly lanceolate and somewhat obtuse.

The description of *B. revoluta* in 'Eng. Fl.' corresponds better with *B. Hornschuchiana* than with the species intended, and it is possible that the *B. gracilis* of English authors may belong in part to *B. Hornschuchiana*.

57. *B. convoluta*, Hedw.*Tortula convoluta*, Sw. Eng. Fl.

Frequent on chalky, gravelly, or sandy soils.

A variety with longer leaves, but always sterile, occurs on walls at Hurstpierpoint.

58. *B. unguiculata*, Hedw.*Tortula unguiculata*, Hook. and Tayl. Eng. Fl.

Common everywhere.

59. *B. fallax*, Hedw.*Tortula fallax*, Sw. Eng. Fl.Frequent, but not so ubiquitous as *B. unguiculata*.

60. *B. vinealis*, Brid.

Common on walls, growing on the sides rather than on the tops ; not often in fruit. The form  $\beta$ . *flaccida* is very common on hedge-banks, but always sterile.

61. *B. squarrosa*, Brid.

*Tortula squarrosa*, De Notaris, Spruce in Lond. Journ. Bot.

Beeding chalk-pit, Mr. Borrer. In small quantity on Woolsonbury Hill, and elsewhere on the Downs, but it is not rare on the cliffs between Brighton and Newhaven, and between Shoreham Harbour and the sea : always sterile.

62. *B. tortuosa*, Hedw.

*Tortula tortuosa*, Hedw. Eng. Fl.

Tottington Mount, Mr. Borrer ; Slindon, Mr. Jenner.

63. *B. marginata*, B. et S.

*Tortula marginata*, Spruce in Lond. Journ. Bot.

Frequent on sandstone walls, and less commonly on bricks ; it occurs also on the sand rocks.

64. *B. muralis*, Hedw.

*Tortula muralis*, Hedw. Eng. Fl.

Everywhere on walls and stones.

65. *B. canescens*, Bruch ; "monoica, gregaria, cæspitosa, humilis, subsimplex ; foliis obovatis et late ovalibus, costa elongata pilosis, margine revolutis, capsula erecta, symmetrica, oblonga, operculo conico, peristomii membrana basilari in tubum oblique tessellatum longe producta."—*Bryol. Europ. Barbula*, p. 34. t. 19.

Cliffs near the Lovers' Seat, Hastings, Mr. Jenner, 1844 ; it has since been gathered in the same place by Mr. Borrer.

Closely resembling *B. muralis*, but rather less in all its parts. The stems are short and almost buried in the fine loose sandy earth of the locality ; the leaves in the lower parts of the stem are oblong or oblong-obovate, the upper ones are oval oblong and a little acuminate, concave, with the margins reflexed ; the nerve is very stout for the size of the leaves, and excurrent into a diaphanous hair-like point, which in the lower leaves often equals the length of the whole leaf, in the upper it scarcely exceeds one-fifth ; the setæ are yellow, and the oblong capsules orange-brown ; the peristome is about half as long as the capsule, and tubular about half its own length ; the operculum is conical, and the calyptra covers about half the capsule.

This moss may at all times be known from *B. muralis* by the long tubular base of the peristome, which corresponds with that of *B. cuneifolia*, *B. ruralis*, and *B. subulata* ; besides this difference the leaves are broader, the upper ones rather acuminate, and all of a less firm and close texture than in *B. muralis*, and its habit is to grow on the earth, where *B. muralis* is rarely seen.

66. *B. cuneifolia* (Dicks.).

*Tortula cuneifolia*, Turn. Eng. Fl.

Tunbridge Wells, "on sandy banks and elsewhere," Forster. Bo-peep, near Hastings, Mr. Jenner; also between Hastings and Winchelsea under the low cliffs; and on a moist sandy bank at Skeims Hill.

67. *B. subulata*, Hedw.

*Tortula subulata*, Hedw. Eng. Fl.

Common on banks.

68. *B. latifolia*, B. et S.

Frequent on trees and posts subject to inundation; not often producing fruit.

69. *B. papillosa*, Wils.

*Tortula papillosa*, Wils. MSS., Spruce in Lond. Journ. Bot.

Frequent on trees and fences, rarely on tiles.

The leaves of this species are not always gemmiferous, and its habit is altogether that of the *Syntrichia*: no trace of inflorescence has been seen.

70. *B. levipila*, Schw.

*Tortula ruralis*,  $\beta$ . *levipila*, Eng. Fl.

Abundant on trees.

71. *B. ruralis*, Hedw.

*Tortula ruralis*, Sw. Eng. Fl.

Very common on roofs; on the ground; rarely on trees. When growing on roofs this moss is usually of a brown colour, but when on the earth in sandy or chalky places it becomes of a fine yellow, and the lower portions ferruginous: this state is rarely fertile.

Genus 5. *Ceratodon*, Brid.

72. *C. purpureus* (L.), Brid.

*Didymodon purpureus*, Hook. and Tayl. Eng. Fl.

Genus 6. *Weissia*.

73. *W. crispa* (Hedw.), Mitten.

*Phascum crispum*, Hedw. Eng. Fl.

*Astomum crispum*, Bryol. Europ.

Common on the Downs.

When growing in tufts, as is most usual with this species, the leaves on the lower parts of the stems are not divergent; but when the plants grow singly, as sometimes they may be found amongst grass, the leaves are all divergent, and the plants have a very different look, and resemble very closely, except in colour, the next species.

74. *W. Mittenii* (Schimper), Mitten.

*Astomum Mittenii*, Bryol. Europ.

“Cæspitulosum ; caule elatiore flexuoso erecto simplici et ramuloso ; foliis inferioribus late lanceolatis, superioribus sensim majoribus utrisque solidis, sordide viridibus, costa crassa rufa cum apice evanido, perichætialibus tenuioribus, pallidioribus, costa tenuiore viridi, capsula in pedicello longiore subemersa ovata, rostello obtuso subobliquo ; flore masculino terminali, perigonialibus ovato-lanceolatis.”—*Bryol. Europ. l. c.*

On clayey soil in a stubble near Little-ease, and by a roadside near Hurstpierpoint ; very rare in both situations, and growing intermixed with *W. mucronata*, *W. squarrosa*, and *W. multicapsularis*.

More robust than *W. crispa*, and with its capsules on longer setæ : the inflorescence is also somewhat different, being monoicous and polygamous ; the flowers are terminal and sometimes hermaphrodite ; the whole plant is brownish.

75. *W. multicapsularis* (Sm.), Mitten.

*Astomum multicapsulare*, Bryol. Europ.

“Cæspitulosum ; caule procumbente, flexuoso-erecto, dichotome ramoso et ramuloso, unciali et longiore ; foliis caulinis patulis, recurvis, flexuosis, flaccidis, perichætio polyphyllo, foliis perichætialibus erectis, lineari-lanceolatis ; capsula in pedicello perbrevis, ovato-oblonga in rostellum subobliquum producta ; calyptra ad mediam capsulam producta, longius persistente.”—*Bryol. Europ. l. c.*

In very small quantity in several spots by a roadside on a clayey soil near Hurstpierpoint. A much larger moss than *W. crispa*, with broader and longer leaves, and with more stoutly rostrate capsules : the male flowers have not yet been observed.

[It corresponds very closely with the following, which may be noticed here, although it has no claims to be considered a Sussex moss.

*W. convolutacea*, Mitten ; dioica ? caulis breviusculus infra perichætium innovans, monocarpus ; folia inferiora late lanceolata nervo excurrente cuspidata, marginibus inflexis, e basi cauli adpresso patenti-divergentia ; perichætialia e basi subelliptica convolutacea subulato-attenuata, acuta, superne marginibus incurvis : theca in pedunculo brevissimo elliptica, operculo brevi apiculato.

*Phascum crispum*, Mougeot et Nestler, no. 703.

Bedfordshire, Mr. Turner in Hb. Borrer.

As in *W. multicapsularis*, the male flowers have not been seen in this moss ; it also resembles that species in colour and appearance, but differs in the very convolute bases of the perichætial leaves, which quite cover the capsule, and have their margins incurved towards their apices.]

76. *W. longifolia*, Mitten ; monoica ; caulis breviusculus po-

lycarpus; folia inferiora lanceolata nervo excurrente mucronata, marginibus erectis, e basi cauli adpresso patentia; perichætialia longissima e basi lata convolutacea subulato-acuminata acuta apicibus arcuato incurvis; theca in pedunculo brevi, elliptica, operculo brevi apiculato; flos masculus in medio fertilium; folia perigonia ovata acuta.

Gathered in 1836 by Mr. Borrer, near Goldstone Barn near Brighton, growing on a fence bank with *W. viridula*.

In appearance this moss differs greatly from all its allies; the perichætia are crowded together around the central male flower, and their leaves are remarkably long for the small size of the plant. The capsules appear to be slightly coloured, but are too young in all the specimens to ascertain if they may be coloured when mature like those of the *Phascum crispum* of Drummond's 'Musci Americani,' No. 9, which nearly resembles the present moss, and may belong to the same species.

77. *W. aciculata*, Mitten; monoica; caulis elongatus, ramulis fastigiatis polycarpis; folia inferiora e basi latiora erecta lanceolata divergentia nervo excurrente mucronata; marginibus erectis vel parum incurvis; perichætialia e basi lata sensim subulata angusta acutissima nervo excurrente; marginibus erectis; theca in pedunculo brevissimo vel fere sessilis, elliptica, operculo brevi apiculato; flos masculus ut in *W. crispa*.

On clayey soil by a roadside near Hurstpierpoint.

Nearly resembling *W. crispa*, but much more slender, with more attenuated and very acute perichætial leaves, which have the margins erect and not rolled in. The capsules are almost sessile and covered by the perichætial leaves, and the operculum and calyptra are shorter than those of *W. crispa*.

This and the last species present differences from each other, and from the other preceding species, amounting to the same value as those which distinguish *W. squarrosa*, *W. phascoides*, *W. rostellata*, and *W. microstoma*; and in all these mosses there is great difficulty in seizing upon any distinctive character which can be readily defined; yet they cannot well be considered varieties of a single species. *W. crispa* and *W. longifolia* are both found on the chalk, where as yet no intermediate state has been seen. *W. multicapsularis*, *W. Mittenii*, and *W. aciculata* are found on clay, and have but little the appearance of being varieties of each other: still it is possible that some of these at least may be only states of *W. crispa* modified by soil and situation. In all the species the leaves are patent-divergent from an erect base appressed to the stem, and the apices are slightly hooded; the perichætial leaves have the margins more or less involute, and, like the cauline, are very papillose. The inflorescence in *W. multicapsularis* and *W. convolutacea* appears to be dioicous, but the male flowers are yet wanting to both species. The flowers of *W. Mittenii*, although sometimes hermaphrodite, do not essentially differ otherwise from those of *W. crispa*, which has the male flower sometimes terminal. In *W. longifolia* the male flower remains at the extremity of

the axis, apparently from the simultaneous growth of innovations on all sides of the stem beneath it.

78. *W. phascoides* (Wils.), C. Müller.

*Hymenostomum phascoides*, Wils. Bryol. Europ. fasc. 42.

By the margin of the larger pond at Pondleigh near Hurstpierpoint.

With the usual form of this species there sometimes occur stems which are hardly to be distinguished from *W. rostellata*.

79. *W. squarrosa* (Bruch), C. Müller; "monoica; laxe cæspitulosâ, caule annosiore decumbente inæqualiter ramoso; folia squarrosa latiora, margine erecto, haud involuto; theca erecta ovata et elliptica æqualis, operculo anguste conico rostellato."—C. Müller, *Synops.* p. 663.

On clayey soil by a roadside near Hurstpierpoint, and in a stubble at Little-ease.

Very similar to *W. microstoma*, but more slender, with longer stems and shorter and broader squarrose leaves; its fruit too is ripened in November, whereas that of *W. microstoma* is scarcely mature before March or April.

80. *W. microstoma* (Hedw.), C. Müller.

*Gymnostomum microstomum*, Hedw. Eng. Fl.

Common on banks, by roadsides, and on the Downs.

81. *W. tortilis* (Schw.), C. Müller; "monoica; pulvinata cæspitosa dichotome et fastigiata ramosa fasciculata foliosa, viridissima inferne ferruginea parce radiculosa, robusta; folia caulina conferta, sicca valde incumbenti-tortilia, madefacta erecto-patula, inferiora minute ovata, superiora late oblongo-lanceolata, nervo excurrente breviter mucronata, margine integerrima incurva, carinata, subundulata, ubique e cellulis quadratis minutis firmis diaphanis apice folii opacis tenuissime papillois areolata; perichætialia longiora, basi tenerius longius angustius pellucidius areolata; theca in ped. medio flavido turgide ovalis raro cylindræa æqualis vel gibba firma orificio majori rubro post operculi lapsum medio apertum, fuscæscens simpliciter annulata, operculo longirostrato obliquo."—C. Müller, *Synops.* p. 661.

On the cliffs at Gin Gap near Newhaven.

Plants growing together in small patches amongst the short starved herbage on the edge of the cliff, exposed to the full influences of the sea breezes. The stems are from one to three-fourths of an inch high, fastigiately branched; the leaves are green or yellowish green in the upper parts, below ferruginous; the capsules are pale yellowish brown, erect or gibbous, the mouth red and the setæ yellow. It is readily known from *W. mucronata*, to which it is nearest allied, by its much greater size, thicker leaves, and coloured mouth of its capsules, which are ripened in March.

82. *W. mucronata*, Bruch.

*Gymnostomum rutilans*, Hedw. Sp. Musc. t. 3. f. 8-11.

Not very common on clayey banks about Hurstpierpoint.  
Doubtfully distinct from the following species.

83. *W. viridula* (Linn.), Brid.

*W. controversa*, Hedw. Eng. Fl.

Very common and variable in appearance.

84. *W. cirrhata*, Hedw.

Frequent on wooden fences ; sometimes on thatch, on trees, and on the sand rocks.

85. *W. crispula*, Hedw.

Harrison's Rocks, Mr. Borrer, 1810, from whose specimens gathered there, the 'Eng. Bot.' figure was drawn.

86. *W. verticillata*, Brid.

On mortar between bricks round a spring near Hurstpierpoint ; and about the Dripping Well at Hastings.

87. *W. tenuis* (Schrad.), C. Müller.

*Gymnostomum tenue*, Schrad. Eng. Fl.

In the stone-pit at Henfield, but barren.

Genus 7. *Grimmia*, Ehrh.

88. *G. apocarpa*, Hedw.

Not uncommon on walls and roofs ; on exposed flints on the Downs, and on the sand rocks at Tunbridge Wells.

89. *G. pulvinata*, Hook. and Tayl.

Very common on walls and roofs.

90. *G. trichophylla*, Grev.

Rare : it has been gathered in small quantity by Mr. Borrer on some Druidical stones near Brighton, and on a roof at Henfield ; it is also found on a stone wall at Henley Hill, and on rocks at Tunbridge Wells.

91. *G. acicularis* (Hedw.), C. Müller.

*Trichostomum aciculare*, Hedw. Eng. Fl.

On rocks about Tunbridge Wells, and on a wall at Henley Hill.

92. *G. lanuginosa* (Hedw.), C. Müller.

*Trichostomum lanuginosum*, Hedw. Eng. Fl.

On a rock at Henley Hill. It was formerly found on heaps of flints on the Downs near Patcham, by Mr. Borrer.

93. *G. canescens* (Hedw.), C. Müller.

*Trichostomum canescens*, Hedw. Eng. Fl.

In very small quantity on Woolsonbury Hill, and about Tunbridge



Wells; more abundant above Heyshot, and in several other places on the ridge of the Downs; on a tiled roof near Henfield, Mr. Borrer.

94. *G. heterosticha* (Hedw.), C. Müller.

*Trichostomum heterostichum*, Hedw. Eng. Fl.

On all the sand rocks, but fertile only at Tunbridge Wells.

95. *G. fascicularis* (Schrad.), C. Müller.

*Trichostomum fasciculare*, Hedw. Eng. Fl.

In very small quantity on a rock at Henley Hill.

Genus 8. *Zygodon*, Hook. and Tayl.

96. *Z. viridissimus*, Brid.

*Gymnostomum viridissimum*, Hook. and Tayl. Eng. Fl.

Very common on trees, more rare on walls: not rare in fruit, particularly on trunks of trees near the ground.

97. *Z. conoideus* (Dicks.), Hook. and Tayl. Eng. Fl. in part.

*Z. Brebissoni*, B. et S. Bryol. Europ. *Zygodon*, p. 8. t. 2.

*Bryum conoideum*, Dicks.

Rare: on a beech-tree on Newtimber Hill, and more plentifully on Sallows by the Mill Pond at Arundel. Mr. Borrer has gathered it in Charlton Forest, and Mr. Jenner in the Forest near Handcross.

Great as the confusion has been in the names of this and the next species, still it appears that the name *conoideus* is the proper one for this moss, it being the *Bryum conoideum* of Dickson; but if the name given to it by its discoverer is to be suppressed, it ought to take that of *Z. Dicksoni* rather than any other.

The peristome of this species is double, as described by Hooker and Taylor; not simple, as it is described and figured in 'Bryol. Europ.'

98. *Z. Forsteri* (Dicks.), Mitten; "monoicus; pulvinatus humilis breviter ramosus, inferne tomentosus viridissimus; folia caulina dense conferta, madefacta patula, e basi angustiore ampliuscule hexagone reticulata sensim late ovato-lanceolata s. subspathulato-acuminata, planiuscula nervo ante apicem evanido crassiusculo, integerrima, e cellulis ubique magnis perfecte hexagonis chlorophyllosis firmis areolata; perichætialia basi multo laxius reticulata; theca in ped. brevi flavido crassiusculo erecta, pyriformi-ovalis, fuscescens 8-striata, ore coarctata, operculo conico subulato obliquo; perist. dentes externi 8 bigeminati latiusculi subrugulosi pallide lutescentes sicci reflexi apice liberi, interni: cilia 8 cum dent. alternantia breviora anguste subulata hyalina subrecta."—C. Müller, *Synops.* p. 667.

*Z. conoideus*, Brid. i. p. 590; *Bryol. Europ.* p. 8. t. 2; C.

Müller, *Synops.* p. 667.

*Gymnostomum viridissimum*, in part Eng. Fl.

*Bryum Forsteri*, Dicks.!

Near Hastings, Mr. Jenner.

No precise locality is known for this moss, but one small tuft was found amongst mosses collected by Mr. Jenner in the neighbourhood of Hastings.

Stems scarcely half an inch high, growing in dense tufts, the upper portions dark green, the lower pale and covered with whitish rootlets; the leaves are patent, subspathulate or widely lanceolate, shortly acuminate carinate; the nerve vanishes just below the apex; the texture of the leaves is composed of perfectly hexagonal cells in the upper part, and in the lower part they are elongated and colourless; the perichæatial leaves are rather longer, but of the same shape as the cauline: the setæ are about a quarter of an inch long and yellowish; the capsules are erect pyriform-ovate, when dry ovate pyriform and eight-striate; the operculum conical subulate, oblique; the external peristome consists of eight bigeminate minutely rugose whitish teeth, the internal of eight subulate colourless cilia, alternating with the external teeth; the calyptra resembles that of *Z. viridissimus*, and covers about one-third of the capsule.

Although the confusion has been very great respecting the present species and *Z. conoideus*, still there seems no just reason why Dickson, who was the first to observe and describe these two mosses, should have his names set aside because others have confounded them and imposed names of their own.

In Mr. Borrer's herbarium is preserved a small portion of an original specimen gathered by Mr. Forster on a felled tree at Chapel-end, Walthamstow, and this being the source of Dickson's species places beyond doubt the fact that his *Bryum Forsteri*, "capsulis erectis denticulatis, setis adscendentibus surculis subacaulibus, foliis ovatis," is the same as the *Z. conoideus* of Bridel and continental authors, who have been altogether misled by the 'Muscologia Britannica.' This moss is still in want of a precise locality, Mr. Forster's specimens being from a felled tree in a timber-yard, and Mr. Jenner's gathered somewhere near Hastings.

#### Genus 9. *Orthotrichum*, Hedw.

##### 99. *O. anomalum*, Hedw.

Not unfrequent on roofs and walls.

##### 100. *O. diaphanum*, Schrad.

Common on trees and fences, rarely on roofs.

##### 101. *O. stramineum*, Hsch.

Not very common, chiefly on beech-trees.

##### 102. *O. rivulare*, Turn.

Rare: it occurs on bushes and roots by the stream at Little-ease near Hurstpierpoint, and on posts at Shermanbury. Mr. Borrer has found it at Henfield, and Mr. Jenner at Lugershall.

##### 103. *O. Sprucei*, Mont.

Frequent on trees and fences by rivulets, always within the reach of occasional inundations.

104. *O. cupulatum*, Hoffm.

Rare : on tiles at Balcombe. Mr. Borrer has gathered it at Storrington, and Mr. Jenner at Lewes.

105. *O. tenellum*, Bruch.

Plentiful on trees about Hurstpierpoint and Henfield, but perhaps not generally common.

106. *O. affine*, Schrad.

Abundant on trees, more rarely on tiles.

107. *O. speciosum*, Nees ab E.

Very rare : one patch was gathered by Mr. Spruce in an orchard at Henfield ; it has since been carefully sought for in the same place without success.

108. *O. rupestre*, Schleich.

*O. rupicola*, Funk. Eng. Fl.

In very small quantity on an ash-tree by a rivulet near New Close, near Hurstpierpoint.

109. *O. striatum*, Hedw.

*O. leiocarpum*, B. et S.

Frequent on trees.

Following C. Müller, the old name has been used for this moss, which, if it is the species so named by Hedwig, ought to retain his name, bad as it may be.

110. *O. Lyellii*, Hook. and Tayl.

Common on trees : unfrequent in fruit, which is mostly found in woods.

111. *O. pulchellum*, Smith.

Rare : in several places near Hurstpierpoint and in Tilgate Forest. On hazel at Midhurst, and on bushes on the beach near Shoreham, Mr. Borrer.

112. *O. crispum*, Hedw.

Not unfrequent, especially on beech-trees, in woods near the Downs.

A somewhat smaller state than usual is sometimes met with, and has been referred to *O. crispulum*, Bruch, but it does not quite correspond with continental specimens.

113. *O. Bruchii*, Hsch.

*O. coarctatum*, B. et S.

Common on trees in woods, particularly in the forests, where it abounds.

114. *O. Ludwigii*, Schw.

Very rare ; on beech-trees on the north side of Woolsonbury Hill. Only three small tufts have been seen.

115. *O. jutlandicum*, Brid. i. p. 296.

*O. phyllanthum*, B. et S.

Common on trees.

Genus 10. *Encalypta*, Schreb.

116. *E. vulgaris*, Hedw.

On the Downs at Halnaker near Chichester, and on the north wall of St. Nicholas Church, Brighton, Mr. Borrer. On a wall at Storrington, and on a wall between Cocking and Midhurst.

117. *E. streptocarpa*, Hedw.

In many places on the Downs: at Newtimber; Arundel Park; Offham near Lewes; and on tiles near Hurstpierpoint: always barren.

[To be continued.]

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XXVI.—On the Development of the Cirripedia.

By C. SPENCE BATE.

[With three Plates.]

FEW animals belonging to the European fauna, so very abundant on our shores as the Cirripedia, have had their nature so misunderstood, and so long veiled in mystery. The happy discovery of Mr. J. V. Thomson, so far back as 1826, approximated somewhat to a revelation of their real history; and the later researches of Burmeister, in his *Beiträge zur Naturgeschichte der Rankenfüßer*, together with those of Prof. Goodsir, in the *Edinburgh New Phil. Journal*, July 1843, have further elucidated this interesting inquiry. Although as yet the chain of development between the ovum and the perfect animal has not been successfully observed, the hiatus is not so great but that naturalists are enabled to identify the position of these creatures in the animal kingdom.

Feeling a little curiosity in relation to the subject, and wishing to verify for myself the observations of Mr. Thomson, I took advantage of my residing near the shore where two or three distinct species are common, and have occupied myself a little this summer in endeavouring to observe the animal, as well as the changes through which the larva passes until it assumes the form and characters of the parent. Being desirous to obtain the young, so as to identify it with the species which are the parent of each, I adopted the mode of breaking off the *Balanus* from the rocks and obtaining the embryo in a mature state before it had left the ovum, and of then hatching it; which was readily accomplished upon its being plunged into sea-water,—a mode which I found